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### **Agroeconomic evaluation of food production in conversion systems to organic farming in Orizona, Goiás state, Brazil**

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#### ***Introduction***

The study proposes to describe two profiles of producers, evidently different in their production base, to guide actions of technology transfer, respecting the way of making of these producers, bringing them to the base of scientific knowledge, with some agricultural and management practices to increase food production through the sustainable use of available resources, such as the conservation of soil, water and biodiversity.

The intention of the producers under analysis is to make their properties viable, from the point of view of the preservation of natural resources, to the production of safe food, the quality of life of humans and animals, with economic gain that can maintain the inputs of basic inputs and exits of clean products, as well as to maintain possible mechanical and manual operations in the property. These producers, with a view on production surplus, expect the facilities of the trade with revenues in sales or exchanges for other regionalised and territorially defined goods.

Already aligning itself with the proposal of the Agenda of the United Nations (UN) of 2015 and the evident proximity of agriculture and food with the development of the country, the Brazilian Agricultural Research Corporation (EMBRAPA) in 2017 proposed among its 12 objectives for Sustainable Development (ODS), a strategic objective for research that is directly related to food, nutrition and health. With a perspective on people, planet, prosperity, partnership and peace, local productive inclusion is sought through production systems geared primarily to family farming.

According to the farmer Manoel Belarmino dos Santos in Notaroberto et al. (2017, p. 43) “development takes place when the inhabitants are the authors, the protagonists of agricultural production, of their riches, the builders of their values”.

Another aspect of fundamental importance for the permanence of man in the field and the maintenance of productive systems is the development of public policies that address basic needs such as health, education, safety and leisure, preservation of eating habits, culture and traditions.

Law No. 11,947 / 2009 obliges that part of the food destined to the National School Feeding Program (PNAE) be derived from family farming, hence an interesting support for regionalized production and promotion of small farms.

National and international actions for the promotion of Food and Nutrition Security and healthy food have directed their strategies to encourage local production, respecting traditions, as well as the cultural and social context in which the individual is inserted, prioritizing regional food habits (Fabri, 2013).

Brazil is a country of great continental dimension and geopolitically constituted by five Regions, 26 States and one Federal District, which are famous for their rich variety in natural resources. The Brazilian history, from the beginning of the colonization, brings in its memory reports of the food culture: its colour, its aroma and its flavour (Brazil, 2015).

In the transition phase from the conventional system to the agroecological system, planning is required to evaluate the best way to market the products, as well as whether production certification will be sought or not. For the commercialization, the fairs are an excellent option, but they need to be stimulated by the municipal governments, with differentiation of the agroecological products. Other options are direct selling by baskets of products, marketing in local supermarkets, and government programs. When brought together in associations or cooperatives, farmers are more likely to succeed.

An important agricultural practice is the production of composting, which is carried out from the use of existing resources on the properties, whether of vegetable origin (litter) or animals (manure). A part of the cattle manure produced is used, usually with or without "tanning" in the fertilization of local vegetables, fruit and grazing, but much is wasted, remaining in the corral and often dripping with rains to the water beds of the properties.

To identify the evolution of the production system and its nuances based on agroecology, the present study was based on an agronomic and socioeconomic technical survey, in the situation before and after the implementation of the techniques developed in participatory research with Embrapa, with monitoring carried out in partnership with local producers.

The general objective of this work is to describe the most important characteristics of two types of producers who are willing to transition from a conventional system of extractivist family agriculture, without retribution to the land factor, to an agroecological system and, specifically, the restoration of soil fertility, the guarantee of water production and the ecological balance, based on empirical and tacit knowledge, in the municipality of Orizona, Goiás.

## ***Material and Methods***

The study was carried out in Orizona municipality, Goiás state, Brazil. Rapid Participatory Appraisal (RPA) was a guiding tool whose application was aimed at the social, economic and environmental situation present in Embrapa Rice & Beans' partner communities before and after the implementation of the research project "Development of alternative fertilizers to support agroecological management of family farming systems in the state of Goiás".

## ***Results and Discussion***

### ***Farm characterisation***

The monitoring of the properties was carried out with technical visits from Embrapa Rice & Beans, with the establishment of the methodology of the implementation of workshops to train the producers and knowledge multipliers. Two properties were selected for the validation of the actions of the Agroecology project of Embrapa Rice & Beans, during the three consecutive years, which were: Sítio Esperança, located 22 km from the county seat of Orizona, and Fazenda Águas Claras, located 14 km from Buritizinho, District of Orizona.

In the Rapid Participatory Appraisal (RPA) for the characterization of the producer, we considered: (a) the physical, social and intellectual relationship of the producers, in the development of the economic activity, (b) the type of agriculture and livestock in exercise, (c) the condition of land tenure and use, water availability and waste management, (d) the use of machinery and equipment in the property, as well as (e) form of associations, means of communication and access to technical assistance and technology transfer.

In the physical, social and intellectual relation, it was verified that only a small family of producers, consisting of three people lives on the property. These people did not go to school for

5 years, although there is a 1st and 2nd grade school, a technical agricultural and medical school, a medical center and a community center.

The agricultural activity in the property is practiced almost empirically, by the family with low schooling, but it is economically self-sustaining. In the property with the family more schooling, the focus is on milk production, as an alternative to increase income.

The less educated families who have experimented with conventional practices in their production systems have decided to migrate to the agroecological system and have abandoned all pesticides and synthetic inputs for some years and are in the final phase of agroecological transition. However, for now, do not aim at the certification of their products. Livestock activities, even in the property where the producers have more knowledge, are practiced in a conventional way, that is, without the concern of recycling and recovery of waste.

In terms of possession, land use, water availability and waste management, punctuating the small property with an area of 24 hectares, with agriculture and livestock. The empirical producer currently owns a cassava plantation with crops and a banana already formed three years ago, with greater intensification in the dry season. Even with the natural resources available, these producers are interested in the production of vegetables, having started planting pumpkins during the project years. They also produce common beans, eventually. Agricultural activities could benefit from available stream water, through irrigation, with existing single-phase electrification.

It should be noted that after the implementation of the project's actions, these producers who exploit livestock, with the creation of cattle, start to manage the waste generated in this activity, in a partial way, since in previous years this waste, commonly, were left at the place of production, usually in the corral.

In the association of agricultural activities, livestock breeding cattle manure is used in composting. This would be the main organic animal waste produced locally. Regarding plant residues, litter is available, which is the accumulation of leaves, branches and seeds forming a layer on the ground of native areas (forest), banana leaves from commercial or homegrown bananas, as well as several forage grasses. Water availability, with the presence of a river, stream and a semiartesian well, is observed in the property. The electrification is single-phase. These producers already own their land holdings.

Regarding the accomplishment of the activities and the existence of local improvements that favour the routine of the empirical producers, with the use of machines, it is observed that only the use of brush cutters and motorcycle use is used for the supervision of the areas and transportation of small volumes (2 cartons) of products for marketing, which usually takes place at Orizona County Fairgrounds. As improvements and structure, there are in the property an electric network, piped water, cell phone, corral, milk cooler tank with capacity for 1,000 litres and fences that guarantee the safety of the areas.

Already, with the most informed and trained producers, they usually own larger areas and apportion them for economic exploitation. For example, an area of 51 hectares is prorated for agricultural exploration, favouring livestock farming. In their properties are a tire tractor, cane harvester (silage), ratchet, agricultural cart, levelling grid, harrow, grinder, disc plow, pickup truck and motorcycle. And, as improvements and structure, there are besides the electrical network, piped water, landline, corral and fences.

In the aspect of training and improvement of rural activities, it is evident that producers with low levels of education usually associate themselves with the Credit Cooperative and participate in the newly created association of producers. The access to credit is being made possible by Cooperative of Orizona and Banco do Brasil.

The property counts only with a limited technical assistance from the State Agency for Technical Assistance, Rural Extension and Agricultural Research (Emater Goiás) and the producer does not buy inputs from sellers seeking the property. And, whenever invited, accept to participate in field days. The most educated producers with the largest properties in the municipality of Orizona are associated with the Cooperatives. These producers whenever guests participate in field days in

activities related to the projects of Embrapa, lectures and courses offered by institutions linked to the agricultural sector.

### ***Technological profile and farm management***

One aspect of great relevance for the rural development and maintenance of the productive systems is the economic, social and environmental viability of the properties, in the perspective of the sustainability, which is based on the preservation and the agricultural exploitation without damages to the environment, that is, in a balanced agroecological system, in which all participants of this complex are favoured.

The present diagnosis identified the agricultural management and processes that are used in the properties, where the producers work with knowledge acquired by family succession, but with low schooling and others with higher education, with training in technical schools and university. Among the agricultural and management practices usually found, farmers emphasize (a) liming and fertiliser use, (b) conservation, soil preparation and direct planting, (c) seed use in previous plantations, (d) weed control, (e) occurrence and control of pests, (f) occurrence and control of diseases, (g) harvesting, (h) storage and commercialization, (i) labour.

Liming and fertilization practices by the less educated grower need some improvement. They are receptive to the technical recommendations, since the chemical analysis of the soil is carried out, usually once a year. In fertilization, this producer, already in the final phase of agroecological transition, uses only organic fertilizers. Prior to the implementation of the project, he only used the biofertilizer, produced by himself, and cattle manure from the property or, also, chicken bed from neighbours. However, most fertilization with these materials is done empirically. Cover fertilization is not done frequently, but when using the biofertilizer. Also, it does not know the cost of production of these agricultural practices.

The producer with more schooling, every two years, the correction of the acidity of the soils with limestone, in the arable areas, using 2 t / ha, following the recommendation of the chemical analysis of soil performed by the specialist. The chemical urea protected fertilizer and the SSP fertilizer, of the formula 5-25-15, are generally used in the applied dose of 300 to 400 t / ha. It also uses as organic fertilizer the aged bovine manure, *in natura*, generated in the property.

Agricultural practices such as conservation, tillage and no-tillage, usually carried out with the use of heavy machinery, are not used in the property managed by the less favoured producers with capital and with knowledge. No-tillage is done, only in less than 1 hectare, destined to the cultivation with banana on the brachiaria grass, which is used for the formation of straw.

In the property managed by the most qualified producer, terraces are used for soil conservation and the practice of subsoiling and scarification is not practiced. However, the heavy grating and levelling grid is used. Still, no tillage is practiced, since its core business is cattle raising.

The seeds that growers use is identified as grains from previous plantations, purchased from people in their friendship cycle, without any phytosanitary treatment before planting them.

In the control of spontaneous plants, in the agricultural area, the most decapitalized and low-educated producer uses hoes and brush cutters. In the small family property where the producer has a greater business performance, the spontaneous herbs are controlled with chemicals, applied manually, with sprayers.

In the incidence of pests in the agricultural areas, the most disadvantaged producer, controls manually, using the crop, without using any chemical for control, since it is in agroecological transition and is, like its neighbours, extremely worried about the harmful effects that pesticides can cause to health. In both properties, producers still use ancient, unconventional methods of popular knowledge, such as benzation to mitigate pest attack, from the observation of the incidence of pest insects, such as the spittlebug.

In the occurrence and control of diseases, the small farmer usually observes the incidence of diseases in the crop, but no product is used for the control. The cattle rancher, as he does not have large area crops, does not observe crop diseases.

Still, as a component of the production system, harvesting is carried out entirely manually by decapitalized farmers. On the other hand, the producer, who acts in the livestock business, with a little more resource, handles the harvesting of the small area occupied with the cane, usually manually, i.e., if the cane is cut and then mechanized, triturate and produce silage. Post-harvest work, which aggregates storage and marketing, mainly of fruits harvested on the property, does not require storage and is marketed directly at Orizona Municipal Free Trade Fairs, which has no market for large offers. All milk production is destined to the Municipal Cooperative. A fully-fledged workforce is required to carry out agricultural activities. If there is a need to perform a ploughing, one hour of rented tractor, with the payments made based on the average prices in force in the municipality. The dairy livestock activities are performed in 98% per registered rural worker, with a fixed contract and only 2% with services contracted per day.

### ***Conclusions and Outlook***

The present study was based on the differences of internalization during a participatory research project to family-level managers and at various levels of schooling, working in food-based production systems with agroecological transition, in the municipality of Orizona, in the state of Goiás, allows to conclude that:

- The organic market in the region is promising, with an average advantage of 20% profitability over conventional products. However, consumer awareness is lacking to accept this difference, to the detriment of the quality of the product.
- Small producers are forming an association that will facilitate the joint marketing of their agroecological products. Fairs would be a good option to market and strengthen the local market, but there is a need for public policies, whether municipal, state or federal, that stimulate and facilitate the implementation of agroecological fairs for family farmers, as well as raising the awareness of the local population about the consumption of agroecological and local products.
- The greatest difficulty faced by these producers is the lack of specialized and qualified technical assistance from the State of Goiás for the work with milk in the region, as well as for the agroecological transition. The process of composting was not a difficulty, and was established, at the end of the project, as an additional routine within the common activities of both.
- The most capitalized producer expects the residues generated by livestock to be reused rationally in their property for local sustainability, with a greater awareness of the people who deal with and work on the property.

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